ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

ENERGY SAVINGS OPPORTUNITY SURVEY FORT WAINWRIGHT, ALASKA

Volume I: Executive Summary

Prepared for

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PREFACE

The final report of this Energy Savings Opportunity Survey, provided as part of the Energy Engineering Analysis Program for Fort Greely, Fort Richardson and Fort Wainwright, Alaska, is organized as a separate report for each installation. The Fort Greely and Fort Richardson reports each consist of five volumes, while the Fort Wainwright report is made up of four volumes.

Volume I, ***Executive Summary***, briefly summarizes the findings and recommendations of the study, presenting the information in comparative terms.

Volume II, ***Report***, reiterates the ***Executive Summary*** and provides a description of the scope of the study and of the methods and approach used in collecting and analyzing data. It also contains a more detailed discussion regarding the findings and recommendations for Energy Conservation Opportunities, project development, operations and maintenance considerations, as well as Low Cost/No Cost projects recommended for implementation.

Volume III, ***Documentation***, consists of the documentation forms and supporting information to present funding requests for projects developed by this study.

Volume IV, ***Appendices***, contains the calculations and reference material supporting the report documentation. Appendix 1 contains the ***Scope of Work*** contracted for performance of this study. It should be noted that a revision to the Scope of Work, expanding the study, follows the original document. Appendix 2, ***ECO 45 Introduction***, serves as a comprehensive reference point for analysis of applying pipe insulation. When this ECO is examined in the buildings under study, the reader may be referred to this section. Appendices 3 through 19 document the analyses performed for each ECO and building combination. Each building is contained in a separate appendix.

ENERGY ENGINEERING ANALYSIS PROGRAM

ENERGY SAVINGS OPPORTUNITY SURVEY
FORT WAINWRIGHT, ALASKA

Volume I: Executive Summary

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ENERGY SAVINGS OPPORTUNITY SURVEY
FORT WAINWRIGHT

EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Authorization

This Energy Savings Opportunity Survey (ESOS) of select facilities at Fort Wainwright is provided as part of the Energy Engineering Analysis Program (EEAP). Similar studies were undertaken concurrently for Fort Richardson and Fort Greely and are contained in separate reports. The study was initiated 30 September 1986. From August 1987 through May 1988 the project was temporarily suspended until a revised Scope of Work was issued.

1.2 Purpose

The EEAP is a series of studies intended to identify energy conservation opportunities (ECOs) which will result in the optimum use of energy resources available. The overall purpose of this study was to identify means to save energy through investment in the application of energy conserving technologies. This objective was approached by the evaluation of pre-identified ECOs within specified buildings that might yield positive economic return to the Government, if undertaken, and that would fit within the constraints of several funding programs available to the Department of the Army.

1.3 Scope

The Fort Wainwright study was limited to examination of 35 ECOs as they may apply to one or more of 17 buildings specified by the Scope of Work. The Scope of Work also called for technical audit and analysis of one of the 17 buildings: the Laundry Facility (Building 3025).

1.4 Summary of Results

In all, 247 separate ECOs were examined. Of that number, 51 (21%) are recommended for implementation. Of the 51 recommended ECOs, 44 were combined into 9 separate packages, and appropriate documentation was developed. Table 1 summarizes some features of the developed projects.

TABLE 1. SUMMARY OF DEVELOPED PROJECTS

Developed Project Funding Source and Description	Steam Energy Savings (MBTU)	Elect. Energy Savings (KWH)	Annual Energy Savings ($)	FY87 Savings/ Investment Ratio	FY87 Simple Payback	QRIP FY90 Payback	Programmed Year (FY90) Project Costs
QRIP PACKAGE #1: Energy - Pipe Insulation & HVAC Time Clocks	1,234	0	4,123	13.89	1.03	1.21	4,759
QRIP PACKAGE #2: Energy - Heating Controls	16,265	0	54,327	17.87	0.68	0.83	39,100
QRIP PACKAGE #3: Energy - Replace Lights	0	51,291	3,032	6.32	1.76	1.92	9,051
OMA-L PACKAGE #1: Replace Lights & Install Fans for Energy Conservation	5,561	5,177	18,879	3.75	3.49		76,363
OMA-L PACKAGE #2: Reclaim Heat for Energy Conservation	1,578	897	5,323	2.40	6.16		36,829
OMA-L PACKAGE #3: Provide EMCS System for Energy Conservation	834	21,738	4,071	1.59	6.63		28,889
OMA-L PACKAGE #4: Add Insulation for Energy Conservation	4,333	0	14,473	1.98	6.61		111,854
OMA-L PACKAGE #5: Provide Occupancy Sensors for Energy Conservation	0	49,200	2,908	1.70	5.59		18,940
OMA-L PACKAGE #6: Weatherstripping for Energy Conservation	973	0	3,251	6.19	1.77		6,713

Three projects identified for development qualify under the QRIP portion of the Productivity Capital Investment Program and appropriate documentation was developed. In addition, six projects were identified which can qualify for OMA-L energy project funds and documentation for that program is also included. No projects qualify for application of ECIP, OSD PIF or PECIP funds, nor for Low Cost/No Cost implementation.

1.5 Maintenance Recommendations

Two maintenance ECOs (ECO 57, Optimize Steam and Condensate Maintenance, and ECO 62, Steam Traps) were dealt with separately from the ECOs referenced above. Discussion of these ECOs was developed in conjunction with other maintenance considerations.

During the execution of the project, some 100 engineer field hours were consumed analyzing ECOs on site. Along with the information explicitly required of the Scope of Work, field engineers could not help but notice evidence of operations and other non-energy related system upgrades that could prove cost effective, or enhance the effectiveness of the mission, if implemented.

Maintenance delivery systems utilized to maintain the Government facilities located at Fort Wainwright could be measurably improved. Preliminary analysis indicates that the effectiveness of these systems could potentially be increased by 30%. Thus, we recommend a Fort-wide, comprehensive analysis of all maintenance delivery systems. Such a project should include analysis of purchasing, warehousing, personnel training, and upkeep of maintenance information.

Such an analysis, if targeted at Fort Wainwright alone could require as much as 1,500 professional man-hours of effort. If undertaken as a part of a comprehensive Alaska District project, the Fort Wainwright element could be much reduced because of economies of scale and similarity of systems from Fort to Fort.

2. BUILDING DATA

This project has been concerned with the performance of energy consuming systems in 17 selected buildings. Table 2, Buildings Investigated, lists the building number, type, gross area and the year constructed of the buildings investigated during the execution of this contract. In all, this work addresses some 1,200,000 square feet of built space constructed to provide a variety of functions.

Fort Wainwright is located in interior Alaska just south of Fairbanks. The location is sub-Arctic and continental. It is typified by extremely cold winters and mild, dry summers. All functions necessary to support the men and women assigned to the Fort are contained within its confines; the Fort is a self-sufficient community. The bulk of the facilities that make up the Fort were constructed in the 1940's and 1950's. Facilities have been added over the years since that time, but construction methods and building systems employed are, by and large, typical of 1950's technology; now 35 years old.

Summary information concerning the applications of various ECOs within various buildings is contained in a number of tables displayed in Section 5 of this Executive Summary.

TABLE 2. BUILDINGS INVESTIGATED
Fort Wainwright

BLDG	DESCRIPTION	GROSS SQ.FT.	YEAR BUILT	
1001	EM BKS W/ MESS	157784	1950	(1)
1004	EM BKS W/ MESS	157784	1950	(1)
1557	MNT HANGAR CO	126621	1942	
2085	MNT HANGAR CO	50200	1944	(2)
2106	MNT HANGAR CO	69700	1957	
3005	MNT HANGAR CO	50300	1943	
3008	MNT HANGAR CO	50200	1944	(2)
3013	GEN PURP WHS	30420	1944	
3015	ENGR ADM BLDG	5878	1954	
3025	FIXED LAUNDRY	33230	1955	
3401	EM BKS W/MESS	109044	1953	
3411	EM BKS W/ MESS	44067	1953	
3421	VEH MAINT SHOP	24480	1953	(3)
3425	VEH MAINT SHOP	25719	1953	
3452	GYMNASIUM	41499	1953	
3479	VEH MAINT SHOP	24480	1953	(3)
3485	VEH MAINT SHOP	24740	1955	

(1) These are identified by the Scope of Work as "identical buildings;" Bldg. 1001 study applied to 1004.

(2) These are identified by the Scope of Work as "identical buildings;" Bldg. 2085 study applied to 3008.

(3) These are identified by the Scope of Work as "identical buildings;" Bldg. 3479 study applied to 3421.

3. PRESENT ENERGY CONSUMPTION

Fort Wainwright is served with a mix of energy sources. District steam (100 psi at 325°F.) and electricity is produced by a government owned, coal fired, cogeneration plant. The Golden Valley Electric Association (an REA cooperative) has an agreement with the government to purchase from, and sell electricity to, the government. The cogeneration plant is provided coal through a contract with the Usibelli Coal Mine, Inc.

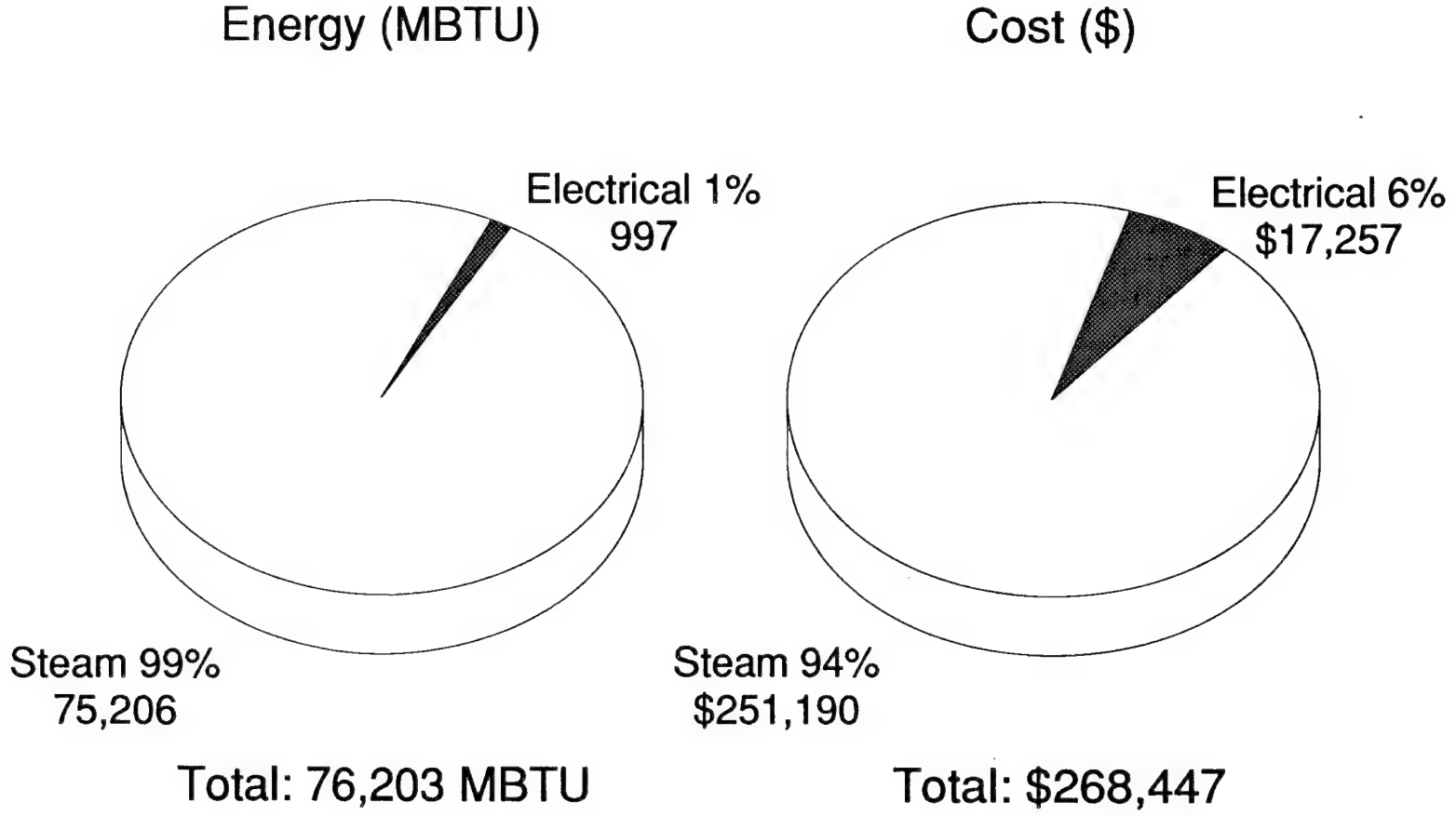
Figure 1, Present Energy Use, summarizes the energy consumption associated with developed ECOs. When reviewing the values of energy consumed, the reader is reminded that the work reported upon herein was focused on specific, energy consuming **building systems**, as contrasted with total energy consumed by the facility under study. For example, when analyzing the advisability of insulating steam piping, the analysis was focused on calculation of energy wasted to the surroundings before and after the steam pipe was insulated. Since the heat transmitted from the steam source to the steam appliance, through the steam pipe, was assumed to be unaffected by application of the ECO, transmitted heat is not accounted for in the analysis, nor is it reported herein.

This consideration is also important when examining energy consumption by system as in Table 3 and Figure 2. Table 3 lists the present energy consumption of systems for which ECOs were developed. In presenting this information here, ECOs dealing with similar systems have been grouped together, e.g., those dealing with building insulation are accumulated under Building Envelope, while those dealing with various HVAC systems controls have been totaled as Mechanical Air Systems. Figure 2 graphically presents this data for each type of system as a percentage of the total.

FIGURE 1

Present Annual Energy Use*

Fort Wainwright



* Present Energy Consumption Related to Developed Projects

FPE 89

TABLE 3. PRESENT ANNUAL ENERGY CONSUMPTION BY SYSTEM*

SYSTEM	ELEC ENERGY (KWH)	ELEC ENERGY (MBTU)	ELEC COST ($)	STEAM ENERGY (MBTU)	STEAM COST ($)	TOTAL EL&ST ENERGY (MBTU)	TOTAL COST ($)
Building Envelope	0	0	0	8,038	26,847	8,038	26,847
Air Stratification	0	0	0	13,767	45,982	13,767	45,982
Mechanical Air Systems	0	0	0	49,944	166,816	49,944	166,816
Mechanical Water Heating Systems	1,437	5	85	1,967	6,569	1,972	6,654
Heated Fluid Piping Systems	0	0	0	414	1,382	414	1,382
Energy Management and Control Systems	29,914	102	1,767	1,076	3,594	1,178	5,361
Electrical Systems	260,706	890	15,405	0	0	890	15,405
TOTALS	292,057	997	17,257	75,206	251,190	76,203	268,447

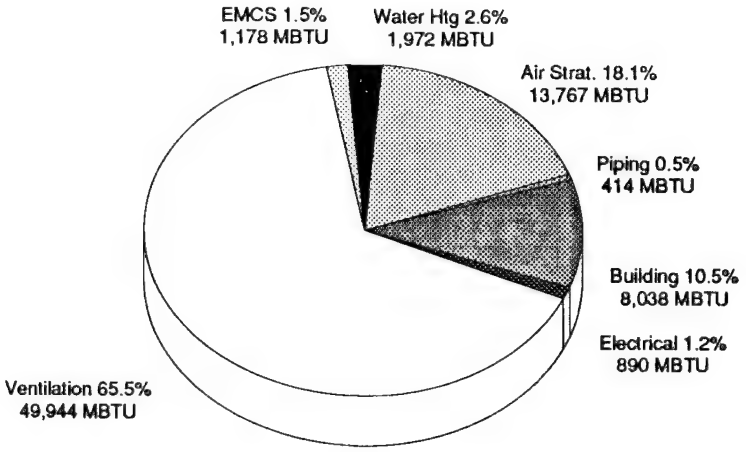
* Present energy consumption related to developed projects.

FIGURE 2

Present Annual Energy Use By System*

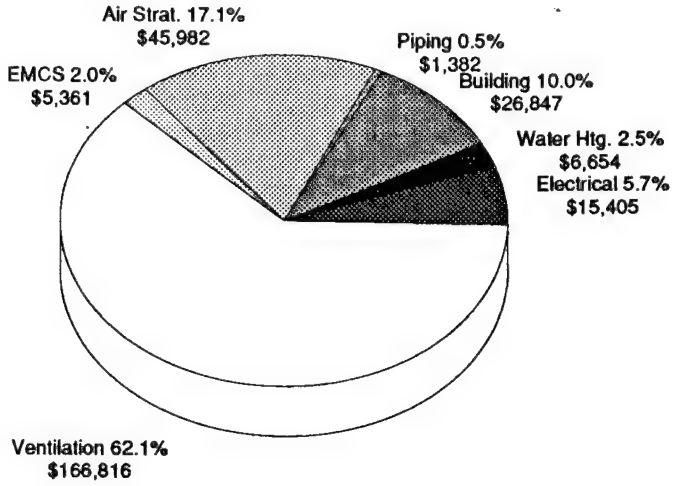
Fort Wainwright

Energy (MBTU)



Total: 76,203 MBTU

Cost ($)



Total $268,447

* Present Energy Consumption Related to Developed Projects

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4. HISTORICAL ENERGY CONSUMPTION

Since the focus of this study was on specific building systems that consume energy, no historic data was available because such systems are not metered. In fact, individual buildings are not equipped with steam, condensate or kilowatt-hour meters, thus measuring energy consumption at individual buildings is not possible at this time. Furthermore, because of the structure of the Scope of Work, estimates of past energy consumption for the various buildings would be of only academic value to the work reported upon here. Therefore, historical energy consumption was not estimated, nor is it reported upon herein.

5. ENERGY CONSERVATION ANALYSIS

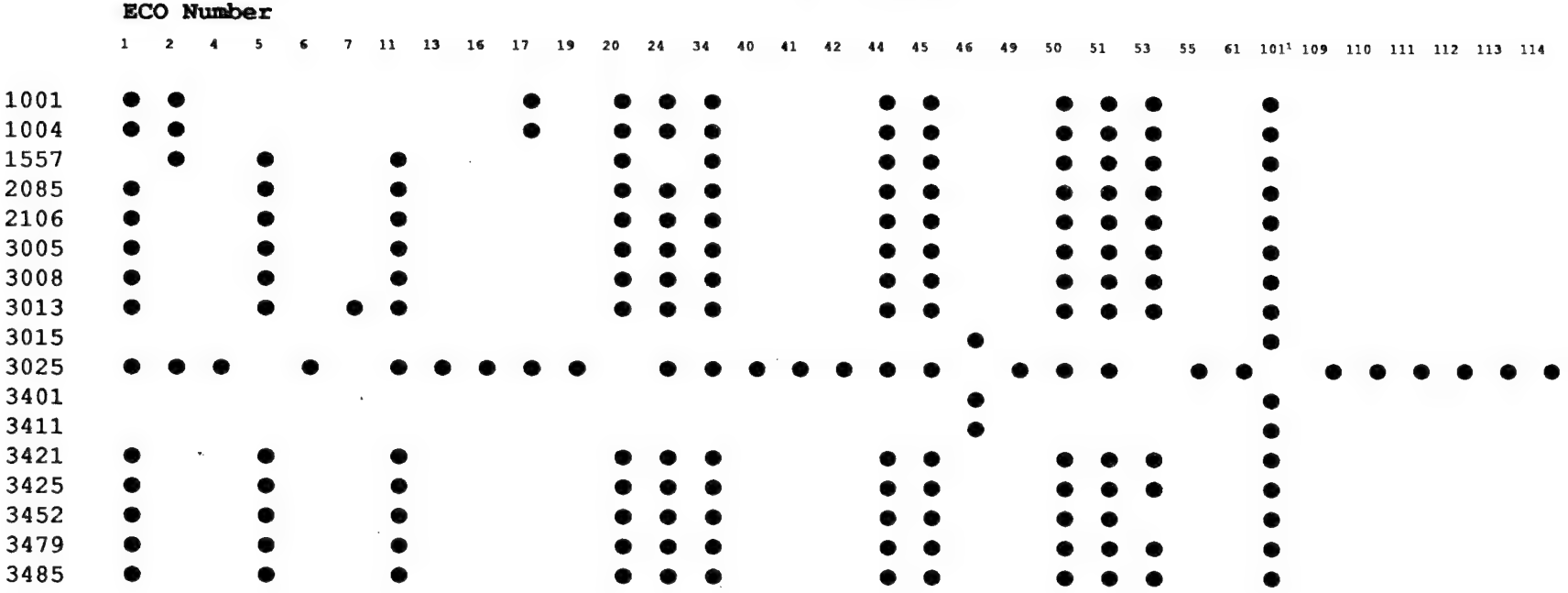
A total of 247 separate ECO analyses were carried out during the analysis of building systems serving 17 buildings. On average, about 15 separate ECO analyses were performed for each building.

5.1 ECOs Investigated

Table 4, Investigated ECOs, correlates the buildings to each ECO investigated. Following that Table is a descriptive listing which provides summary definitions of each ECO.

It should be noted that, as indicated on Table 4, only 173 ECO/building intersections required evaluation. However, 247 separate analyses were conducted. The reason for the disparity lies in the fact that separate analysis of the same ECO was carried out in more than one point in many buildings. For example, the analysis associated with insulation of a 4-inch steam main was separated from the analysis of insulation of a 2-inch hot water line. Thus, multiple analyses were carried out for one ECO; for example, "ECO 45, Insulate Piping," in some cases may have involved up to ten analyses (subtitled ECO 45 A through J). As previously stated, the maintenance ECOs 57 and 62 received separate treatment from those listed in the Table, and are discussed in conjunction with other maintenance considerations.

TABLE 4
Investigated ECOs Summary
Fort Wainwright



Note: 1. ECO 101: For buildings in which ECO 20, 34 or 44 has been analyzed, the related portion of ECO 101 will not appear as a separate analysis.

5.1.1 ECO Definition Summary

The following listing provides summary descriptions, preceded by the ECO number and name assigned, of each ECO investigated at Fort Wainwright.

BUILDING ENVELOPE & ARCHITECTURAL ECOs

01 Insulate Walls and/or Roof

The thermal efficiency of the building envelope may be economically enhanced by adding or replacing roof and/or wall insulation.

01A Insulate walls above ground; 3' pre-fab wall panels, flashings

01B Insulate below grade walls; 3" polystyrene insulation, insulation guard

01C Insulate walls above ground; R-13 batt insulation, vapor barrier, 5/8" gypsum board, 4" rubber base

01D Insulate roof; flood coat roof, 4" rigid insulation, concrete pavers, raised roof curbs

01E Insulate roof; 4-ply built-up roof, R-30 batt insulation, flashing, cants

01F Insulate roof; 2" X 4" vertical supports and bracing, 2" X 6" ceiling joists, R-30 batt insulation, vapor barrier, gypsum board

01G Insulate roof; R-30 batt insulation, vapor barrier

01H Insulate roof; pre-fab roof panel, flashing

01I Insulate roof; 2' x 4' vertical supports and bracing, ceiling joists, R-30 batt insulation, vapor barrier, plywood

02 Install Double Glazings

The thermal efficiency of the building envelope may be economically enhanced by replacing existing glazing units with more thermally efficient double glazed units.

02A Install double glazings; replace set of nine 2'-2" X 3'-11" single-glaze, triple-hung windows with double-glazings

02B Install double glazings; replace set of six 2'-2" X 3'-11" single-glaze, triple-hung windows with double-glazings

04 Reduce Glass Area

The thermal efficiency of the building envelope may be economically enhanced by removing some existing glazing units and extending the existing envelope construction over the location previously occupied by those glazing units.

05 Prevent Air Stratification

The heat loss through the roof may be economically reduced by reducing the temperature gradient that frequently develops in poorly mixed room air.

06 Vestibules

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at frequently used exterior doors. Such results can frequently be achieved through the addition of vestibules.

07 Loading Dock Seals

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at frequently used exterior doors. Such results can frequently be achieved through the addition of loading dock seals that effectively form a gasket between truck trailers and overhead doors in areas where freight is shipped and received.

11 Weather Stripping and Caulking

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at windows, doors and construction penetrations in the envelope.

11A Weatherstrip and caulk 3'-0" X 7'-0" personnel doors

11B Weatherstrip and caulk 14'-0" X 13'-6" overhead doors

11C Weatherstrip and caulk 8'-0" X 8'-0" overhead doors

11D Weatherstrip and caulk 10'-0" X 10'-0" overhead doors

11E Weatherstrip and caulk fixed windows

11F Weatherstrip and caulk double-hung wood-frame windows

11G Weatherstrip and caulk awning wood-frame windows

11H Weatherstrip and caulk wood-frame casement windows

13 Thermal Storage

In cases where more waste heat may be recovered than can be economically used at the time of recovery, the use of the architectural features of the building may allow for economical energy savings.

MECHANICAL AIR SYSTEMS

16 Reclaim Heat From Laundry Equipment

Laundry equipment consumes large amounts of energy. Heat wasted in hot wash water going down the drain may be economically recovered to provide space heat.

17 Reclaim Heat From Ventilation Air

Buildings often exhaust large quantities of warm air. Heat may frequently and economically be extracted from the exhaust air and used to preheat fresh outside make-up air.

19 Reclaim Heat from Dryer Equipment

Laundry dryers consume large quantities of energy. Heat contained in the dryer exhaust may frequently and economically be recovered.

20 Revise/Replace HVAC Controls

Controls, in many buildings, may be defeated by occupants untrained in controls maintenance, may be inappropriate to serve the requirements of changing occupancy and/or facility management guidelines, or may be in need of substantial repair or renovation. Such problem controls systems are frequently the cause of wasted energy.

24 Duct Insulation

Insulating ducts in forced air heating and ventilation systems mitigates energy loss. This retrofit measure often times may be economical.

101 Install Timeclocks - All Systems

Energy consumption can be reduced by shutting down or reducing temperature setpoints of HVAC, building heating and domestic hot water heating systems during unoccupied periods. This ECO looks at accomplishing ECO 20-Revise/Replace HVAC Controls, ECO 34-Night Setback/Setup Thermostats, ECO 44-Shut off Energy to Hot Water Off Use, by installing a timeclock to control systems. ***Note: For buildings in which ECO 20, 34 or 44 has been analyzed, the related ECO 101 will not appear.***

101A Install timeclock on HVAC system

101B Install timeclock on building heating system

101C Install timeclock on domestic hot water system

114 Upgrade HVAC Equipment to Operate More Efficiently

As time passes and use patterns change, the load imposed on HVAC equipment is often subject to change. This ECO requires review of HVAC equipment to determine whether energy can be saved by equipment replacement or derating through modification.

MECHANICAL SPACE HEATING SYSTEMS

34 Night Setback/Setup Thermostats

In the past, thermostats that had setback/setup functions were very expensive or not available. Today such thermostats are relatively inexpensive and constitute appropriate and economical energy retrofit equipment.

MECHANICAL WATER HEATING SYSTEMS

40 Lower Domestic Hot Water Temperature

Savings can be realized by lowering the domestic hot water supply temperature since heat loss from the storage tank, supply piping and recirculation piping will be reduced. Often, it is not possible to simply lower the setpoint of the hot water generator. For example, the hot water generator may supply showers as well as kitchen facilities. The high temperature requirements of the kitchen would have to be supplied. This ECO investigates system modifications, if any, that are required in order to be able to reduce the domestic hot water supply temperature.

41 Use Heat Pump to Heat Domestic Water

When a source of waste heat is available, it is some times economically feasible to move the waste heat with a heat pump to water heating temperature.

42 Reclaim Heat from Wash Water

Heat contained in spent wash water may some times be economically recovered and used to heat fresh rinse or wash water.

44 Shut off Energy to Hot Water Off Use

When domestic hot water systems are not programmed for use for an extended period of time (hours), it may be economically feasible to shut the system down to reduce heat loss as well as save pumping energy.

45 Piping Insulation

Some domestic hot water and hydronic building heating systems have been installed with inadequate insulation or no insulation at all.

ENERGY MANAGEMENT AND CONTROL SYSTEMS

46 "EMCS" CONTROLS

The introduction of an Energy Management and Control System offers the potential of energy (and labor) savings due to better control of facility systems. In addition, an EMCS offers facility managers data on which to base and evaluate changes in the operation of the connected buildings.

ELECTRICAL SYSTEMS

49 Reduce Lighting Levels

Lighting level reductions in areas of very high illumination can yield energy savings. This ECO addresses reducing lighting levels to recommended levels. ECOs 50 and 51 also address over illuminated areas as part of incandescent replacements.

50 Replace Incandescents System with Fluorescents

As a lighting source, incandescent fixtures have generally low light output for power supplied to the fixture. This ECO addresses replacing inefficient incandescent fixtures with new fluorescent fixtures in office and standard height ceiling areas. See ECO 51 for high ceiling areas.

51 Replace Incandescents System with HPS

As a lighting source, incandescent fixtures have generally low light output for power supplied to the fixture. This ECO addresses replacing inefficient incandescent fixtures with new High Pressure Sodium (HPS) fixtures in high bay areas where color rendition is not a critical factor.

53 Occupancy Sensors for Lighting Control

In individual or small office spaces, lights are generally left on during lunch, breaks and other periods during the day when these spaces are unoccupied. This ECO suggests occupancy sensors be installed in offices to turn the lights within the space off during times when the room is not occupied.

MAINTENANCE SYSTEMS

55 Optimize Laundry Operations

Over time, fabrics have changed and efficient laundry equipment has been developed. This ECO has to do with the energy analysis associated with improving the operation of the laundry by modifying or replacing existing equipment and/or noting improvements in operations which could reduce energy consumption.

57 Optimize Steam/Condensate System Operations

As systems grow in size and complexity, demand upon the steam systems change. Furthermore, some steam system components may have deteriorated with time in service. This ECO has to do with the energy analysis associated with improving the operation of the steam and condensate return systems.

61 Correct Condensate Return Pipe Size

The condensate return system is two phase (steam and condensate) and multiple pressure (pumped and gravity returns). In order for steam traps to function properly and thus enable the heat transfer equipment to operate efficiently it is important that the condensate return line have sufficient carrying capacity.

62 Steam Traps

The steam trap is of paramount importance in insuring that the latent heat of the steam is given up in the heat transfer equipment. There are a variety of trap designs, each with its proper application. This ECO will evaluate the energy costs associated with steam

trap maintenance and note the applicability of the various traps observed in the facilities chosen for analysis.

109 Control Dryer Operations with Temperature Sensor

Energy is lost when laundry dryers continue to operate after the laundry is dry. This ECO addresses use of a temperature sensor to avoid overdrying.

110 Recycle Rinse Water

Most modern laundry washing machines have a feature that enables rinse water to be used as wash water. Many older wash systems do not have such a feature; in such instances, it may be economically feasible to modify older machines with such a feature.

111 Use Cool Water for Laundry

Some laundry washing operations can be adequately performed using cooler water. Laundry supplies are available for cooler water temperatures. This ECO addresses systematic reduction in wash water temperature.

112 Shut Off Steam During Non-Use Hours

Reduction of standby energy losses from steam piping to process equipment can be achieved by shutting down the steam when the process is not in operation.

113 Increase Efficiency of Compressed Air System

Factors such as motor and pipe sizing can significantly affect the efficiency of compressor operation. This ECO addresses methods of reducing identified energy losses.

5.2 Recommended ECOs

Table 5, Recommended ECOs, correlates individual buildings to recommended ECOs. Table 6 provides supplemental information in the form a listing of the ECO number and name, building number and name, Savings to Investment Ratio (SIR), Simple Payback (SP) and Construction Working Estimate (CWE) as of the analysis base year of FY87, all ranked according to decreasing SIR. As in the case of investigated ECOs, more ECOs are recommended in Table 6 than are indicated in Table 5 due to additional sub-sets of ECOs.

TABLE 5
Recommended ECOs Summary
Fort Wainwright

	ECO Number																																
	1	2	4	5	6	7	11	13	16	17	19	20	24	34	40	41	42	44	45	46	49	50	51	53	55	61	101	109	110	111	112	113	114
1001	●													●										●									
1004	●													●										●									
1557				●										●								●											
2085	●						●							●										●									
2106	●													●				●						●									
3005	●													●										●									
3008	●						●							●										●									
3013							●																	●									
3015																				●													
3025	●																●					●						●		●				
3401																																	
3411																																	
3421	●											●												●									
3425	●											●												●									
3452	●											●		●					●								●						
3479	●											●																					
3485	●											●												●									

RECOMMENDED ECO'S

TABLE 6

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
1	20	HVAC controls-revise/repl	3452	GYMNASIUM	46.86	0.21	4,114
2	20B	HVAC controls-revise/repl	3421	VEH MAINT SHOP	35.42	0.37	2,392
3	20B	HVAC controls-revise/repl	3479	VEH MAINT SHOP	35.42	0.37	2,392
4	20B	HVAC controls-revise/repl	3425	VEH MAINT SHOP	35.42	0.37	2,392
5	20B	HVAC controls-revise/repl	3485	VEH MAINT SHOP	35.42	0.37	2,392
6	101A	Install Time Clocks	3452	GYMNASIUM	27.07	0.55	682
7	101A	Install Time Clocks	3452	GYMNASIUM	21.61	0.69	682
8	34	Night setback/setup therm	2106	MNT HANGAR CO	21.25	0.52	4,123
9	34	Night setback/setup therm	1557	MNT HANGAR CO	12.34	0.89	9,970
10	45D	Piping insulation	3452	GYMNASIUM	12.23	1.07	1,333
11	34	Night setback/setup therm	3452	GYMNASIUM	6.89	1.61	4,208
12	101A	Install Time Clocks	3452	GYMNASIUM	6.75	2.24	682
13	11A	Weather stripping/caulk	2085	MNT HANGAR CO	6.45	1.69	2,186
14	11A	Weather stripping/caulk	3008	MNT HANGAR CO	6.45	1.69	2,186
15	50	Incandenscents to fluor	3025	FIXED LAUNDRY	6.32	1.76	7,712
16	11B	Weather stripping/caulk	3013	GEN PURP WHS	5.34	2.05	1,348
17	34	Night setback/setup therm	3005	MNT HANGAR CO	4.78	2.50	3,221
18	34	Night setback/setup therm	2085	MNT HANGAR CO	4.78	2.50	3,221
19	34	Night setback/setup therm	3008	MNT HANGAR CO	4.78	2.50	3,221
20	05	Prevent air stratificat'n	1557	MNT HANGAR CO	3.79	3.48	61,909
21	101A	Install Time Clocks	3452	GYMNASIUM	3.42	4.56	682
22	01B	Insulate walls & roof	2085	MNT HANGAR CO	3.15	4.16	6,964
23	01B	Insulate walls & roof	3008	MNT HANGAR CO	3.15	4.16	6,964
24	50	Incandenscents to fluor	1557	MNT HANGAR CO	2.96	3.67	3,159
25	42	Reclaim heat - wash water	3025	FIXED LAUNDRY	2.41	6.14	30,701
26	44	Hot water-off for no use	2106	MNT HANGAR CO	2.27	6.98	681
27	53	Occup sensors-light contr	1001	EM BKS W/ MESS	2.10	4.54	3,880
28	53	Occup sensors-light contr	1004	EM BKS W/ MESS	2.10	4.54	3,880
29	53	Occup sensors-light contr	3013	GEN PURP WHS	2.02	4.76	171
30	01B	Insulate walls & roof	3005	MNT HANGAR CO	1.80	7.29	6,730
31	01B	Insulate walls & roof	2106	MNT HANGAR CO	1.80	7.29	10,374
32	01B	Insulate walls & roof	3452	GYMNASIUM	1.80	7.29	6,822
33	01B	Insulate walls & roof	3479	VEH MAINT SHOP	1.80	7.29	7,165
34	01B	Insulate walls & roof	3425	VEH MAINT SHOP	1.80	7.29	7,165
35	01B	Insulate walls & roof	3025	FIXED LAUNDRY	1.80	7.29	10,932
36	01B	Insulate walls & roof	3485	VEH MAINT SHOP	1.80	7.29	7,165
37	01B	Insulate walls & roof	3421	VEH MAINT SHOP	1.80	7.29	7,165
38	01B	Insulate walls & roof	1001	EM BKS W/ MESS	1.76	7.46	14,398
39	01B	Insulate walls & roof	1004	EM BKS W/ MESS	1.76	7.46	14,398
40	53	Occup sensors-light contr	3425	VEH MAINT SHOP	1.69	5.62	342
41	46	EMCS	3015	ENGR ADM BLDG	1.59	6.63	24,616
42	53	Occup sensors-light contr	3005	MNT HANGAR CO	1.49	6.40	2,035
43	34	Night setback/setup therm	1001	EM BKS W/ MESS	1.33	9.21	40,168

RECOMMENDED ECO'S

TABLE 6 (CONT'D.)

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
44	34	Night setback/setup therm	1004	EM BKS W/ MESS	1.33	9.21	40,168
45	53	Occup sensors-light contr	2085	MNT HANGAR CO	1.31	7.30	2,052
46	53	Occup sensors-light contr	3008	MNT HANGAR CO	1.31	7.30	2,052
47	110	Recycle Rinse Water	3025	FIXED LAUNDRY	1.28	12.02	24,773
48	53	Occup sensors-light contr	3485	VEH MAINT SHOP	1.25	7.46	171
49	53	Occup sensors-light contr	3421	VEH MAINT SHOP	1.16	8.22	581
50	53	Occup sensors-light contr	2106	MNT HANGAR CO	1.08	8.81	975
51	112	Shut Off Steam-Nonuse Hrs	3025	FIXED LAUNDRY	1.03	14.38	63,759

5.3 Not Recommended ECOs

Table 7, Not Recommended ECOs, correlates individual buildings to ECOs not recommended for implementation and provides a key to the reasons these ECOs were rejected.

Table 8, is structured similarly to Table 6 except that it applies to those ECOs not recommended. It contains the ECO number and name, building number and name, and the reason the specific ECO was not recommended. As can be seen, some ECOs were rejected because corrective measures had already been installed, a design project was already in progress which addressed that ECO, or the ECO was not appropriate or not applicable to the building under study. Other ECOs which did not fall into that category were analyzed, but the economic analysis revealed that ECO implementation would not be cost effective. For those ECOs, the Savings to Investment Ratio (SIR) has also been included in the Table.

TABLE 7
Not Recommended ECOs Summary
Fort Wainwright

	ECO Number																															
	1	2	4	5	6	7	11	13	16	17	19	20	24	34	40	41	42	44	45	46	49	50	51	53	55	61	101	109	110	111	112	113	114
1001		IN								NE		NA	NA					NE	NE			IN	NA										
1004		IN								NE		NA	NA					NE	NE			IN	NA										
1557		NE					NE					NA						NE	NE				NA	NA									
2085				IN								NA	NA					NE	NA			IN	IN										
2106				NE			NE					NA	NA						NE			IN	IN										
3005				IN			NE					NA	NA					NE	NA			IN	IN										
3008				IN								NA	NA					NE	NA			IN	IN										
3013	NE			NE		NA						NA	NA	IN				NE	NA			IN	IN										
3015																																	
3025		NE	NE		IN		NE	NA	DIP	NE	NE		NA	NA	NE	NA		NE	NA		NA		NA		MA	NA		NE		NA		NA	NE
3401																				NE													
3411																				MA													
3421				NE			IN						DIP	IN				NE	DIP			IN	IN										
3425				NE			DIP						DIP	IN				NE	DIP			IN	IN				NE						
3452				IN			IN						NA					NE				IN	IN										
3479				NE			IN						DIP	IN				NE	DIP			IN	IN	NA									
3485				NE			IN						DIP	IN				NE	DIP			IN	IN										

Legend:
- NE = ECO Not economical
- NA = ECO Not applicable to this building
- IN = ECO already installed.
- DIP = ECO implementation already under design

NOT RECOMMENDED ECO'S

TABLE 8

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
1	01A	Insulate walls & roof	1001	EM BKS W/ MESS	Not Economical	0.04
2	01C	Insulate walls & roof	1001	EM BKS W/ MESS	Installed / Corrected	
3	02	install double glazing	1001	EM BKS W/ MESS	Installed / Corrected	
4	17	Reclaim heat-ventilation	1001	EM BKS W/ MESS	Not Economical	0.99
5	20	HVAC controls-revise/repl	1001	EM BKS W/ MESS	Not Appropriate	
6	24	Duct insulation	1001	EM BKS W/ MESS	Not Appropriate	
7	44	Hot water-off for no use	1001	EM BKS W/ MESS	Not Economical	0.65
8	45A	Piping insulation	1001	EM BKS W/ MESS	Not Appropriate	
9	45C	Piping insulation	1001	EM BKS W/ MESS	Not Appropriate	
10	45D	Piping insulation	1001	EM BKS W/ MESS	Not Appropriate	
11	45E	Piping insulation	1001	EM BKS W/ MESS	Not Economical	0.81
12	45G	Piping insulation	1001	EM BKS W/ MESS	Not Economical	0.90
13	45H	Piping insulation	1001	EM BKS W/ MESS	Not Economical	0.81
14	50	Incandenscents to fluor	1001	EM BKS W/ MESS	Installed / Corrected	
15	51	Incandenscents to HPS	1001	EM BKS W/ MESS	Not Appropriate	
16	01A	Insulate walls & roof	1004	EM BKS W/ MESS	Not Economical	0.04
17	01C	Insulate walls & roof	1004	EM BKS W/ MESS	Installed / Corrected	
18	02	install double glazing	1004	EM BKS W/ MESS	Installed / Corrected	
19	17	Reclaim heat-ventilation	1004	EM BKS W/ MESS	Not Economical	0.99
20	20	HVAC controls-revise/repl	1004	EM BKS W/ MESS	Not Appropriate	
21	24	Duct insulation	1004	EM BKS W/ MESS	Not Appropriate	
22	44	Hot water-off for no use	1004	EM BKS W/ MESS	Not Economical	0.65
23	45A	Piping insulation	1004	EM BKS W/ MESS	Not Appropriate	
24	45C	Piping insulation	1004	EM BKS W/ MESS	Not Appropriate	
25	45D	Piping insulation	1004	EM BKS W/ MESS	Not Appropriate	
26	45E	Piping insulation	1004	EM BKS W/ MESS	Not Economical	0.81
27	45G	Piping insulation	1004	EM BKS W/ MESS	Not Economical	0.90
28	45H	Piping insulation	1004	EM BKS W/ MESS	Not Economical	0.81
29	50	Incandenscents to fluor	1004	EM BKS W/ MESS	Installed / Corrected	
30	51	Incandenscents to HPS	1004	EM BKS W/ MESS	Not Appropriate	
31	02	install double glazing	1557	MNT HANGAR CO	Not Economical	0.23
32	11A	Weather stripping/caulk	1557	MNT HANGAR CO	Not Economical	0.70
33	11E	Weather stripping/caulk	1557	MNT HANGAR CO	Not Economical	0.90
34	20	HVAC controls-revise/repl	1557	MNT HANGAR CO	Not Appropriate	
35	44	Hot water-off for no use	1557	MNT HANGAR CO	Not Economical	-0.53
36	45A	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
37	45B	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
38	45C	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
39	45D	Piping insulation	1557	MNT HANGAR CO	Not Economical	0.91
40	45E	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
41	45F	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
42	45G	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
43	45H	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
44	45I	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
45	45J	Piping insulation	1557	MNT HANGAR CO	Not Appropriate	
46	51	Incandenscents to HPS	1557	MNT HANGAR CO	Not Appropriate	
47	53	Occup sensors-light contr	1557	MNT HANGAR CO	Not Appropriate	
48	01A	Insulate walls & roof	2085	MNT HANGAR CO	Not Economical	0.22
49	01I	Insulate walls & roof	2085	MNT HANGAR CO	Not Economical	0.11
50	05	Prevent air stratificat'n	2085	MNT HANGAR CO	Installed / Corrected	
51	11C	Weather stripping/caulk	2085	MNT HANGAR CO	Not Economical	0.61
52	11E	Weather stripping/caulk	2085	MNT HANGAR CO	Not Economical	0.90
53	20	HVAC controls-revise/repl	2085	MNT HANGAR CO	Not Appropriate	
54	24	Duct insulation	2085	MNT HANGAR CO	Not Appropriate	
55	44	Hot water-off for no use	2085	MNT HANGAR CO	Not Economical	-0.64
56	45A	Piping insulation	2085	MNT HANGAR CO	Not Appropriate	
57	45B	Piping insulation	2085	MNT HANGAR CO	Not Appropriate	
58	45F	Piping insulation	2085	MNT HANGAR CO	Not Appropriate	
59	45H	Piping insulation	2085	MNT HANGAR CO	Not Appropriate	
60	50	Incandenscents to fluor	2085	MNT HANGAR CO	Installed / Corrected	
61	51	Incandenscents to HPS	2085	MNT HANGAR CO	Installed / Corrected	
62	01A	Insulate walls & roof	2106	MNT HANGAR CO	Not Economical	0.11
63	01H	Insulate walls & roof	2106	MNT HANGAR CO	Not Economical	0.07
64	05	Prevent air stratificat'n	2106	MNT HANGAR CO	Not Economical	0.23
65	11A	Weather stripping/caulk	2106	MNT HANGAR CO	Not Economical	0.70
66	20	HVAC controls-revise/repl	2106	MNT HANGAR CO	Not Appropriate	
67	24	Duct insulation	2106	MNT HANGAR CO	Not Appropriate	
68	45A	Piping insulation	2106	MNT HANGAR CO	Not Appropriate	
69	45C	Piping insulation	2106	MNT HANGAR CO	Not Appropriate	
70	45E	Piping insulation	2106	MNT HANGAR CO	Not Economical	0.97
71	45F	Piping insulation	2106	MNT HANGAR CO	Not Economical	0.96
72	50	Incandenscents to fluor	2106	MNT HANGAR CO	Installed / Corrected	
73	51	Incandenscents to HPS	2106	MNT HANGAR CO	Installed / Corrected	
74	01A	Insulate walls & roof	3005	MNT HANGAR CO	Not Economical	0.01
75	01I	Insulate walls & roof	3005	MNT HANGAR CO	Not Economical	0.11
76	05	Prevent air stratificat'n	3005	MNT HANGAR CO	Installed / Corrected	
77	11A	Weather stripping/caulk	3005	MNT HANGAR CO	Not Economical	0.70
78	11C	Weather stripping/caulk	3005	MNT HANGAR CO	Not Economical	0.61
79	11E	Weather stripping/caulk	3005	MNT HANGAR CO	Not Economical	0.90
80	20	HVAC controls-revise/repl	3005	MNT HANGAR CO	Not Appropriate	
81	24	Duct insulation	3005	MNT HANGAR CO	Not Appropriate	
82	44	Hot water-off for no use	3005	MNT HANGAR CO	Not Economical	-0.81
83	45A	Piping insulation	3005	MNT HANGAR CO	Not Appropriate	
84	45B	Piping insulation	3005	MNT HANGAR CO	Not Appropriate	
85	45F	Piping insulation	3005	MNT HANGAR CO	Not Appropriate	
86	45H	Piping insulation	3005	MNT HANGAR CO	Not Appropriate	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
87	50	Incandenscents to fluor	3005	MNT HANGAR CO	Installed / Corrected	
88	51	Incandenscents to HPS	3005	MNT HANGAR CO	Installed / Corrected	
89	01A	Insulate walls & roof	3008	MNT HANGAR CO	Not Economical	0.22
90	01I	Insulate walls & roof	3008	MNT HANGAR CO	Not Economical	0.11
91	05	Prevent air stratificat'n	3008	MNT HANGAR CO	Installed / Corrected	
92	11C	Weather stripping/caulk	3008	MNT HANGAR CO	Not Economical	0.61
93	11E	Weather stripping/caulk	3008	MNT HANGAR CO	Not Economical	0.90
94	20	HVAC controls-revise/repl	3008	MNT HANGAR CO	Not Appropriate	
95	24	Duct insulation	3008	MNT HANGAR CO	Not Appropriate	
96	44	Hot water-off for no use	3008	MNT HANGAR CO	Not Economical	-0.64
97	45A	Piping insulation	3008	MNT HANGAR CO	Not Appropriate	
98	45B	Piping insulation	3008	MNT HANGAR CO	Not Appropriate	
99	45F	Piping insulation	3008	MNT HANGAR CO	Not Appropriate	
100	45H	Piping insulation	3008	MNT HANGAR CO	Not Appropriate	
101	50	Incandenscents to fluor	3008	MNT HANGAR CO	Installed / Corrected	
102	51	Incandenscents to HPS	3008	MNT HANGAR CO	Installed / Corrected	
103	01	Insulate walls & roof	3013	GEN PURP WHS	Installed / Corrected	
104	01A	Insulate walls & roof	3013	GEN PURP WHS	Not Economical	0.20
105	05	Prevent air stratificat'n	3013	GEN PURP WHS	Not Economical	0.23
106	7	Loading dock seals	3013	GEN PURP WHS	Not Appropriate	
107	11A	Weather stripping/caulk	3013	GEN PURP WHS	Not Economical	0.55
108	20	HVAC controls-revise/repl	3013	GEN PURP WHS	Not Appropriate	
109	24	Duct insulation	3013	GEN PURP WHS	Not Appropriate	
110	34	Night setback/setup therm	3013	GEN PURP WHS	Installed / Corrected	
111	44	Hot water-off for no use	3013	GEN PURP WHS	Not Economical	-0.10
112	45A	Piping insulation	3013	GEN PURP WHS	Not Appropriate	
113	45C	Piping insulation	3013	GEN PURP WHS	Not Appropriate	
114	45D	Piping insulation	3013	GEN PURP WHS	Not Appropriate	
115	50	Incandenscents to fluor	3013	GEN PURP WHS	Installed / Corrected	
116	51	Incandenscents to HPS	3013	GEN PURP WHS	Installed / Corrected	
117	01A	Insulate walls & roof	3025	FIXED LAUNDRY	Not Economical	0.07
118	01D	Insulate walls & roof	3025	FIXED LAUNDRY	Installed / Corrected	
119	02B	Install double glazing	3025	FIXED LAUNDRY	Not Economical	0.24
120	04	Reduce glass area	3025	FIXED LAUNDRY	Not Economical	0.21
121	06	Vestibules	3025	FIXED LAUNDRY	Installed / Corrected	
122	11A	Weather stripping/caulk	3025	FIXED LAUNDRY	Not Economical	0.75
123	13	Thermal storage	3025	FIXED LAUNDRY	Not Appropriate	
124	16	Reclaim heat-laundry eq	3025	FIXED LAUNDRY	Design - in - Progress	
125	17	Reclaim heat-ventilation	3025	FIXED LAUNDRY	Not Economical	0.02
126	19	Reclaim heat-dryer equipt	3025	FIXED LAUNDRY	Not Economical	0.20
127	24	Duct insulation	3025	FIXED LAUNDRY	Not Appropriate	
128	34	Night setback/setup therm	3025	FIXED LAUNDRY	Not Appropriate	
129	40	Hot water temp - lower	3025	FIXED LAUNDRY	Not Economical	0.98

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
130	41	Heat pump-domestic water	3025	FIXED LAUNDRY	Not Appropriate	
131	44	Hot water-off for no use	3025	FIXED LAUNDRY	Not Economical	27.45
132	45	Piping insulation	3025	FIXED LAUNDRY	Not Appropriate	
133	45A	Piping insulation	3025	FIXED LAUNDRY	Not Appropriate	
134	49	Reduce lighting levels	3025	FIXED LAUNDRY	Not Appropriate	
135	51	Incandenscents to HPS	3025	FIXED LAUNDRY	Not Appropriate	
136	55	Optimize laundry operatns	3025	FIXED LAUNDRY	Not Appropriate	
137	61	Cond return pipe size	3025	FIXED LAUNDRY	Not Appropriate	
138	109	Cntrl Dryers w/Temp Sens.	3025	FIXED LAUNDRY	Not Economical	0.40
139	111	Use Cool Water for Laund.	3025	FIXED LAUNDRY	Not Appropriate	
140	113	Eff. of Compressed Air	3025	FIXED LAUNDRY	Not Appropriate	
141	114	Upgrade HVAC Equipment	3025	FIXED LAUNDRY	Not Economical	0.68
142	46	EMCS	3401	EM BKS W/MESS	Not Economical	0.36
143	46	EMCS	3411	EM BKS W/ MESS	Not Appropriate	
144	01A	Insulate walls & roof	3421	VEH MAINT SHOP	Not Economical	0.05
145	05	Prevent air stratificat'n	3421	VEH MAINT SHOP	Not Economical	0.23
146	11	Weather stripping/caulk	3421	VEH MAINT SHOP	Installed / Corrected	
147	20A	HVAC controls-revise/repl	3421	VEH MAINT SHOP	Not Appropriate	
148	24	Duct insulation	3421	VEH MAINT SHOP	Design - in - Progress	
149	34	Night setback/setup therm	3421	VEH MAINT SHOP	Installed / Corrected	
150	44	Hot water-off for no use	3421	VEH MAINT SHOP	Not Economical	-0.77
151	45	Piping insulation	3421	VEH MAINT SHOP	Design - in - Progress	
152	50	Incandenscents to fluor	3421	VEH MAINT SHOP	Installed / Corrected	
153	51	Incandenscents to HPS	3421	VEH MAINT SHOP	Installed / Corrected	
154	01A	Insulate walls & roof	3425	VEH MAINT SHOP	Not Economical	0.07
155	05	Prevent air stratificat'n	3425	VEH MAINT SHOP	Not Economical	0.23
156	11	Weather stripping/caulk	3425	VEH MAINT SHOP	Design - in - Progress	
157	20A	HVAC controls-revise/repl	3425	VEH MAINT SHOP	Not Appropriate	
158	24	Duct insulation	3425	VEH MAINT SHOP	Design - in - Progress	
159	34	Night setback/setup therm	3425	VEH MAINT SHOP	Installed / Corrected	
160	44	Hot water-off for no use	3425	VEH MAINT SHOP	Not Economical	-0.77
161	45	Piping insulation	3425	VEH MAINT SHOP	Design - in - Progress	
162	50	Incandenscents to fluor	3425	VEH MAINT SHOP	Installed / Corrected	
163	51	Incandenscents to HPS	3425	VEH MAINT SHOP	Installed / Corrected	
164	101A	Install Time Clocks	3425	VEH MAINT SHOP	Not Economical	-0.39
165	01A	Insulate walls & roof	3452	GYMNASIUM	Not Economical	0.07
166	01D	Insulate walls & roof	3452	GYMNASIUM	Not Economical	0.13
167	05	Prevent air stratificat'n	3452	GYMNASIUM	Installed / Corrected	
168	11	Weather stripping/caulk	3452	GYMNASIUM	Installed / Corrected	
169	24	Duct insulation	3452	GYMNASIUM	Not Appropriate	
170	34	Night setback/setup therm	3452	GYMNASIUM	Installed / Corrected	
171	44	Hot water-off for no use	3452	GYMNASIUM	Not Economical	0.66
172	45A	Piping insulation	3452	GYMNASIUM	Not Appropriate	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Wainwright

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
173	50	Incandenscents to fluor	3452	GYMNASIUM	Installed / Corrected	
174	51	Incandenscents to HPS	3452	GYMNASIUM	Installed / Corrected	
175	01A	Insulate walls & roof	3479	VEH MAINT SHOP	Not Economical	0.05
176	05	Prevent air stratificat'n	3479	VEH MAINT SHOP	Not Economical	0.23
177	11	Weather stripping/caulk	3479	VEH MAINT SHOP	Installed / Corrected	
178	20A	HVAC controls-revise/repl	3479	VEH MAINT SHOP	Not Appropriate	
179	24	Duct insulation	3479	VEH MAINT SHOP	Design - in - Progress	
180	34	Night setback/setup therm	3479	VEH MAINT SHOP	Installed / Corrected	
181	44	Hot water-off for no use	3479	VEH MAINT SHOP	Not Economical	-0.77
182	45	Piping insulation	3479	VEH MAINT SHOP	Design - in - Progress	
183	50	Incandenscents to fluor	3479	VEH MAINT SHOP	Installed / Corrected	
184	51	Incandenscents to HPS	3479	VEH MAINT SHOP	Installed / Corrected	
185	53	Occup sensors-light contr	3479	VEH MAINT SHOP	Not Appropriate	
186	01A	Insulate walls & roof	3485	VEH MAINT SHOP	Not Economical	0.05
187	05	Prevent air stratificat'n	3485	VEH MAINT SHOP	Not Economical	0.23
188	11	Weather stripping/caulk	3485	VEH MAINT SHOP	Installed / Corrected	
189	20A	HVAC controls-revise/repl	3485	VEH MAINT SHOP	Not Appropriate	
190	24	Duct insulation	3485	VEH MAINT SHOP	Design - in - Progress	
191	34	Night setback/setup therm	3485	VEH MAINT SHOP	Installed / Corrected	
192	44	Hot water-off for no use	3485	VEH MAINT SHOP	Not Economical	-0.77
193	45	Piping insulation	3485	VEH MAINT SHOP	Design - in - Progress	
194	50	Incandenscents to fluor	3485	VEH MAINT SHOP	Installed / Corrected	
195	51	Incandenscents to HPS	3485	VEH MAINT SHOP	Installed / Corrected	
196	50	Incandenscents to fluor	WAIN	31 BUILDINGS	Installed / Corrected	

5.4 ECIP Projects Developed

No projects eligible for ECIP funding were identified during the course of the study. This finding was due primarily to the minimum cost limit of $200,000 under ECIP.

5.5 Other Energy Programs Developed

Table 9, on the following page, provides a comprehensive summary of the developed projects, including the funding source and project title, analysis year (FY87) cost (construction plus SIOH), the annual electric and steam energy savings in KWHs, MBTUs and dollars, the net annual savings, SIR, simple amortization period (payback), and programmed year cost (construction plus SIOH). It should be noted that the net annual savings shown may differ from the energy savings. In those cases, this is due to increased (or decreased) maintenance costs associated with project implementation.

Three projects identified for development qualify under the Quick Return on Investment Program (QRIP) portion of the Productivity Capital Investment Program and appropriate documentation was developed. In addition, six projects were identified which can qualify for OMA-L energy project funds and documentation for that program was also developed. No projects qualify for application of OSD Productivity Investment Funding (OSD PIF), Productivity Enhancing Capital Investment Program (PECIP) funds, nor for Low Cost/No Cost implementation.

QRIP and OMA-L project costs were escalated to an FY90 program year and include construction cost and SIOH.

5.6 Operational or Policy Change Recommendations

Some key recommendations evolving from this study include:

a) Operations and maintenance systems now in place at Fort Wainwright could be markedly improved through the investment in a comprehensive maintenance delivery system analysis and implementation of the recommendations that flow from such an analysis. Such an analysis should be truly comprehensive, including all aspects of the Fort's operations and maintenance systems to include accounting procedures, inventory control, warehousing, purchasing, staff training and analysis of maintenance service contracts.

b) A comprehensive analysis of operations at the laundry facility (Building 3025). It is estimated that the effort required for an analysis of this depth would account for approximately 700 man-hours. If undertaken in conjunction with a similar study of the laundry at Fort Richardson, the Fort Wainwright element could be reduced because of economies of scale and similarity of facilities. This should include:

TABLE 9

Developed Projects Summary
Fort Wainwright

Developed Project Funding Source and Description	FY 87 Project CWE and SIOH	Steam Energy Savings (MBTU)	Elect. Energy Savings (KWH)	Elect. Energy Savings (MBTU)	Annual Energy Savings ($)	Annual Net Savings ($)	FY87 Savings/ Investment Ratio	FY87 Simple Payback	QRIP FY90 Savings/ Investment Ratio	QRIP FY90 Simple Payback	Programmed Year (FY90) Project Costs
QRIP PACKAGE #1: Energy - Pipe Insulation & HVAC Time Clocks	4284	1234	0	0	4123	3948	13.89	1.03	7.46	1.21	4759
QRIP PACKAGE #2: Energy - Heating Controls	35157	16265	0	0	54327	48901	17.87	0.68	10.12	0.83	39108
QRIP PACKAGE #3: Energy - Replace Lights	8136	0	51291	175	3032	4407	6.32	1.76	4.68	1.92	9051
OMA-L PACKAGE #1: Replace Lights & Install Fans for Energy Conservation	68647	5561	5177	18	18879	18719	3.75	3.49			76363
OMA-L PACKAGE #2: Reclaim Heat for Energy Conservation	33108	1578	897	3	5323	5112	2.40	6.16			36829
OMA-L PACKAGE #3: Provide EMCS System for Energy Conservation	25970	834	21738	74	4071	3728	1.59	6.63			28889
OMA-L PACKAGE #4: Add Insulation for Energy Conservation	100552	4333	0	0	14473	14474	1.98	6.61			111854
OMA-L PACKAGE #5: Provide Occupancy Sensors for Energy Conservation	17027	0	49200	168	2908	2899	1.70	5.59			18940
OMA-L PACKAGE #6: Weatherstripping for Energy Conservation	6035	973	0	0	3251	3251	6.19	1.77			6713

1) Comprehensive process analysis to determine which of the existing equipment would be salvageable in new configurations and which should be changed out for new, modern energy and labor saving equipment. (On the basis of this study it was not possible to justify such replacement from purely energy savings, however, observations indicate that combined energy and labor savings may do so.)

2) Implementation study to determine how to process laundry while new equipment is being installed. This should include consideration of a new laundry facility versus complete renovation of the existing building and replacement of existing equipment.

3) Review of the contract between the Government and the operations contractor with particular attention to possible cost saving incentives.

c) Fort Wainwright now generates electric power required of itself and Fort Greely (the electric energy consumed by Fort Greely is transmitted by the local Golden Valley Electric Association from Fort Wainwright to Fort Greely). It is recommended that the Government commission a study to determine the economic benefit of purchasing electric energy from the local electric power utility. Such a study would require a work effort of about 500 professional man-hours.

d) We recommend that the current stocks of fluorescent (Rapid and Instant Start) lamps and lighting fixture ballasts be liquidated and replaced with compatible energy efficient types (i.e., GE Watt-Miser lamps and Triad Utrad ballasts, or equivalent). Such an action would provide much more immediate energy savings since lamps and ballasts currently in operation would be replaced with the energy efficient type as they fail.

e) We recommend retrofit of existing 40 or 60 watt incandescent lamps in enclosed fixtures or exposed in low profile areas such as storage areas, with new PL Type lamps and adaptors similar to the General Electric Bias Adaptor System. In areas with over 350 hours use per year this retrofit yields an SIR greater than 1.0 and simple payback less than 10 years. For 1,000 hours use the SIR is 3.47 and simple payback is 3.14 years. A net maintenance savings of approximately $4.50 per 1,000 hours of lamp usage is realized by completing this retrofit operation due to the extended overall lamp life of 10,000 hours.

6. ENERGY AND COST SAVINGS

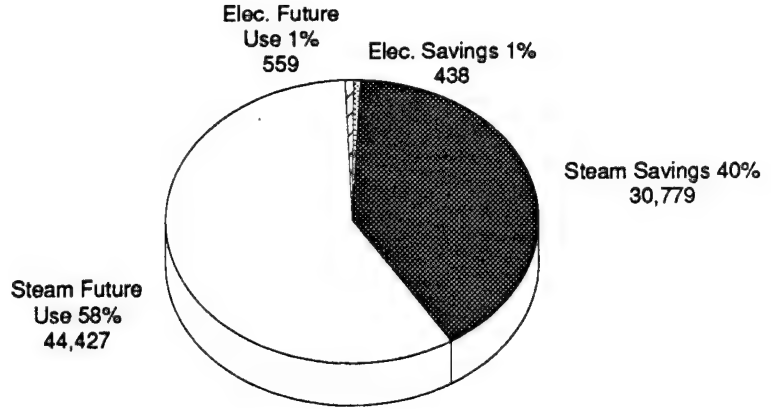
Figure 3, Developed Projects Annual Energy Savings, and Figure 4, Developed Projects Annual Cost Savings, summarize the result of implementation of developed ECOs. Figure 3 indicates that energy consumption will be reduced by 40% for the thermal energy systems analyzed, and 1% for electrical systems analyzed. Figure 4 reflects the dollar savings which would result through project implementation. These show that a total of 31,217 MBTUs and $110,386 would be saved annually through implementation of all developed projects.

Figures 5 through 10 graphically illustrate the energy and associated costs presently being used and the savings accountable to each developed project package.

FIGURE 3

Developed Projects Annual Energy Savings

Fort Wainwright

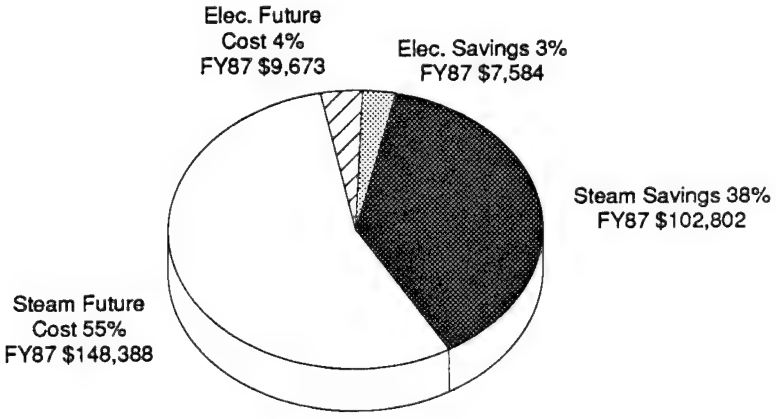


Total Savings : 31,217 MBTU/Year
Total Future Use: 44,986 MBTU/Year

FIGURE 4

Developed Projects Annual Cost Savings

Fort Wainwright



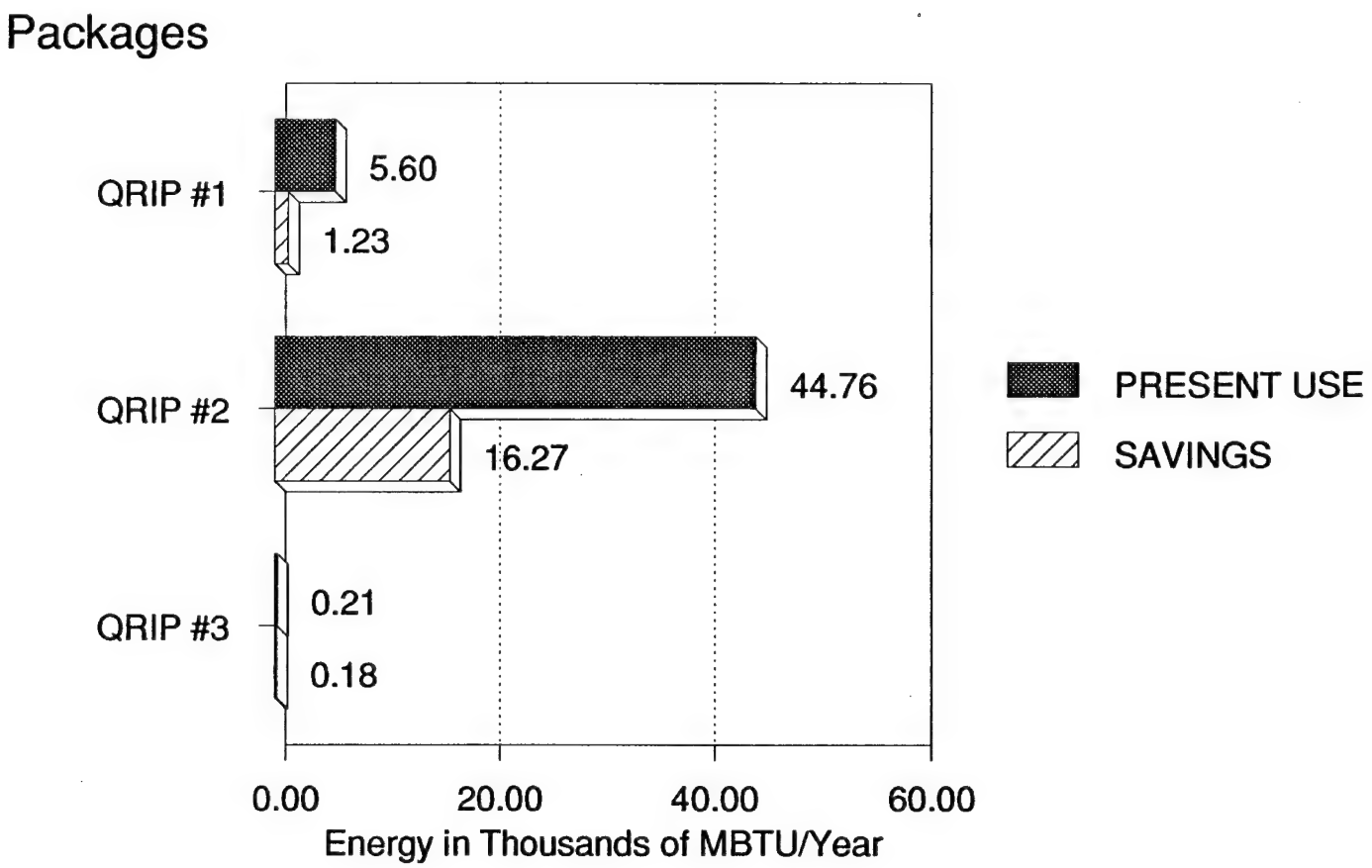
Total Savings : $110,386/Year (FY 1987)
Total Future Cost: $158,061/Year (FY 1987)

FPE 89

FIGURE 5

QRIP Funded Packages

Fort Wainwright



Total Energy Savings: 17,675 MBTU/Year

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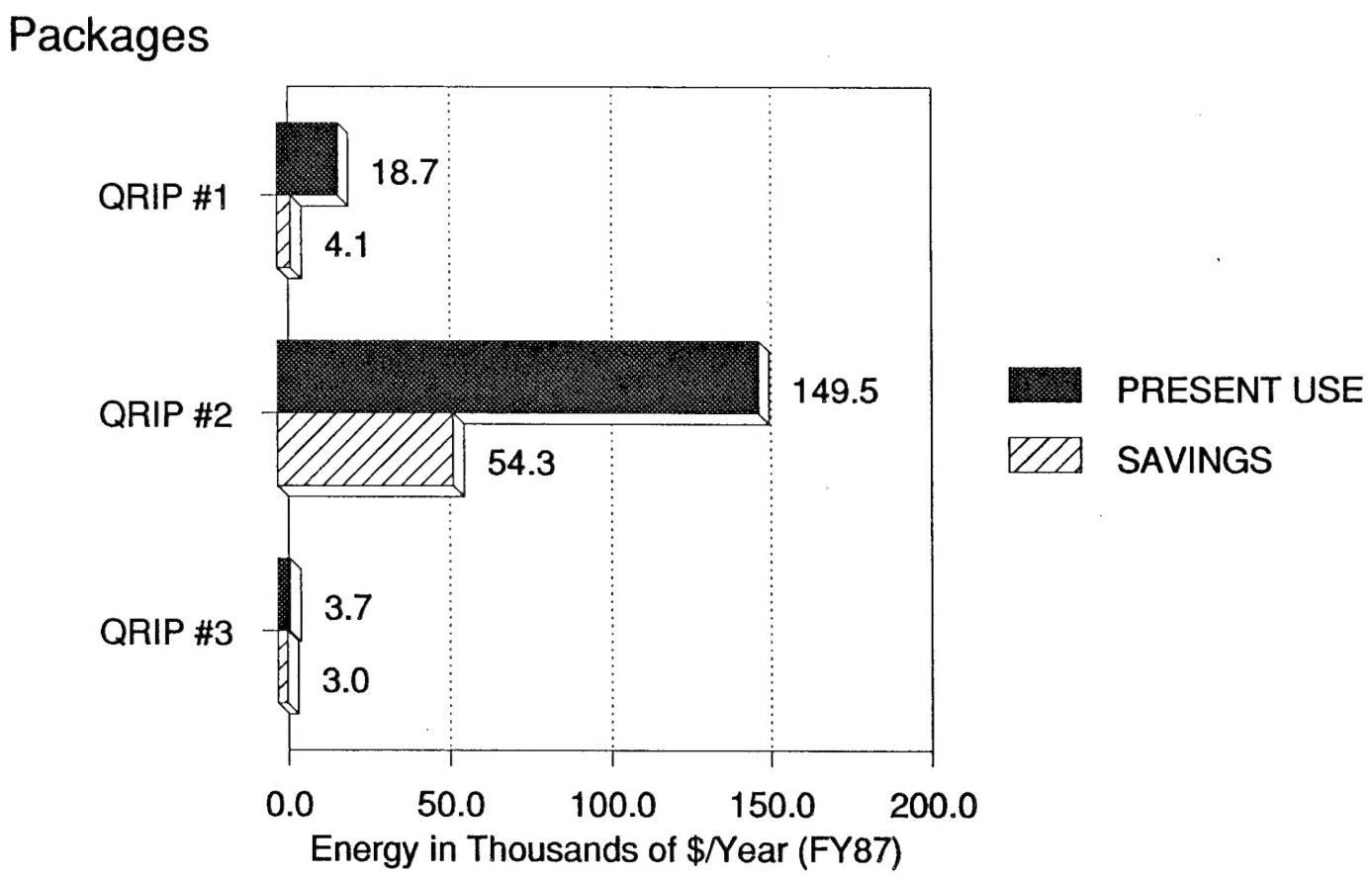
FIGURE 6

QRIP Funded Packages

Fort Wainwright



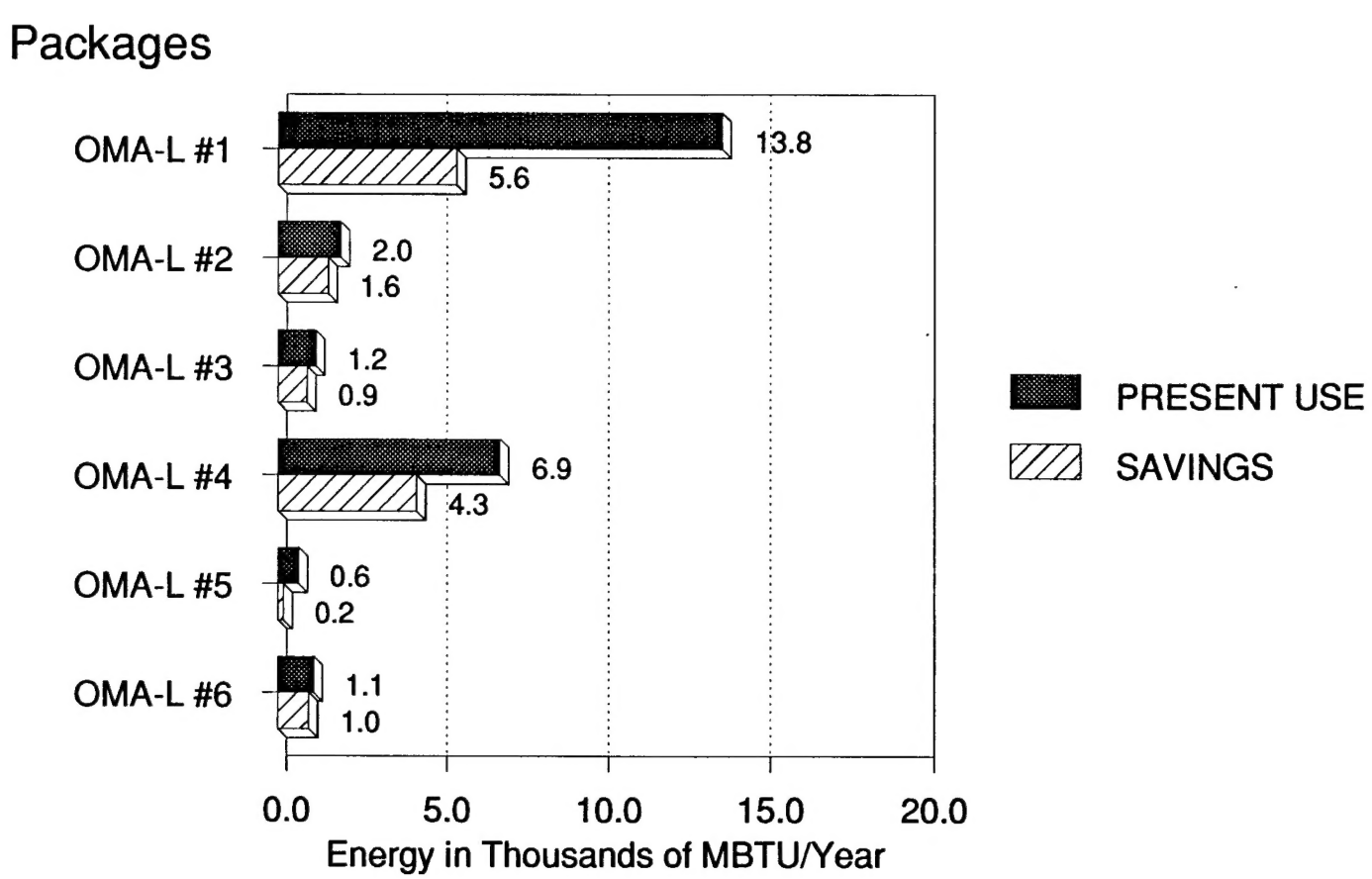
Total Energy Cost Savings: $61,481/Year (FY 1987)

FPE 89

FIGURE 7

OMA-L Funded Packages

Fort Wainwright



Total Energy Savings: 13,542 MBTU/Year

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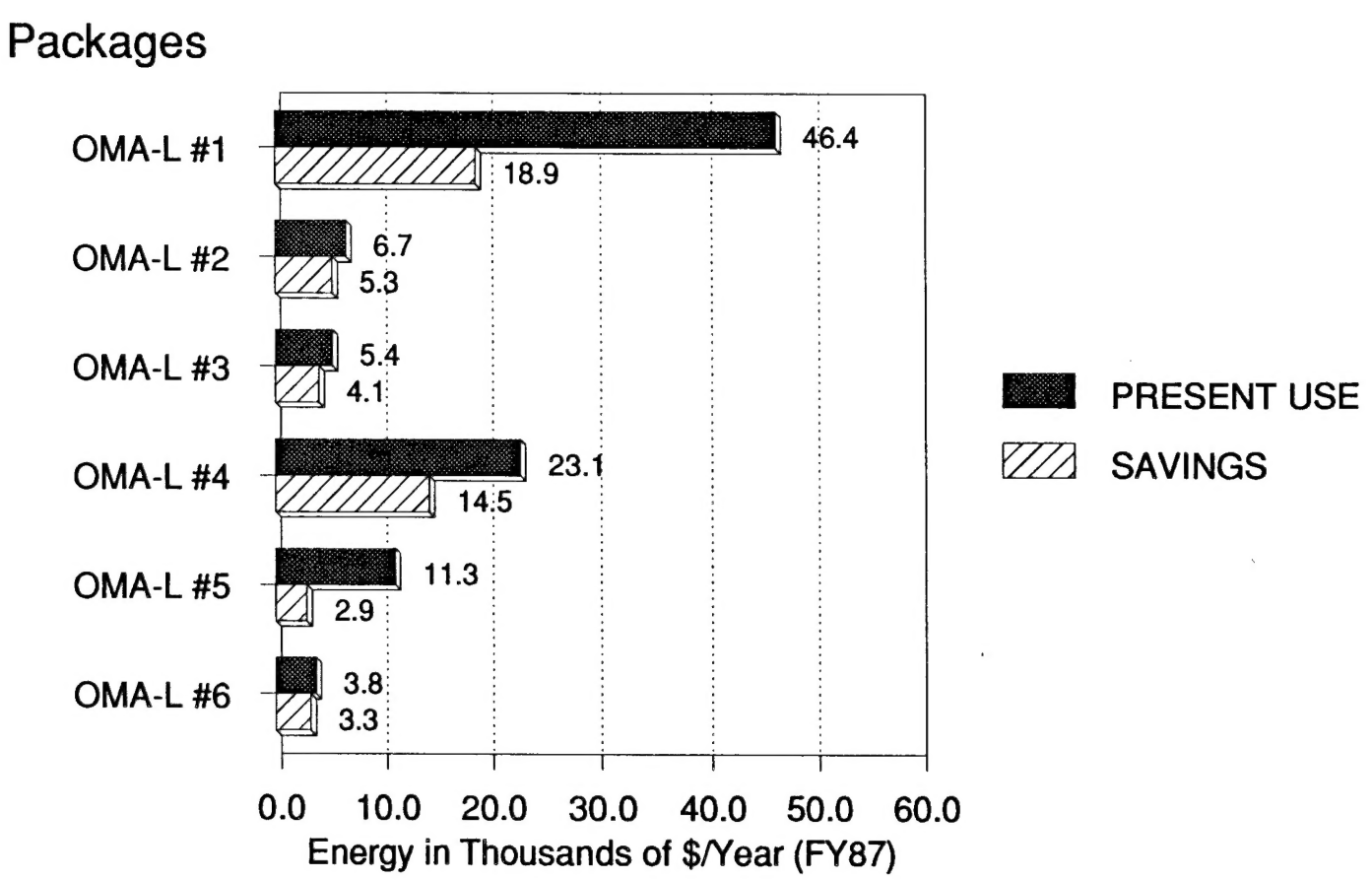
FIGURE 8

OMA-L Funded Packages

Fort Wainwright



Total Energy Cost Savings: $48,905/Year (FY 1987)

FPE 89

7. ENERGY PLAN

Projects identified for development are eligible under QRIP and OMA-L program guidelines. None qualified for ECIP, PECIP or OSD PIF funds, or for Low Cost/No Cost implementation.

7.1 QRIP Projects

QRIP projects have been programmed for implementation during Fiscal Year 1990. It is anticipated that construction could begin in April 1990, with completion by August 1990. These projects are identified as follows:

TABLE 10. QRIP PROJECTS

PROJECT	S.I.R. (FY87)	S.I.R. (FY90)	FY90 COST ($)
QRIP PACKAGE #1: Energy - Pipe Insulation & HVAC Time Clocks	13.89	7.46	4,759
QRIP PACKAGE #2: Energy - Heating Controls	17.87	10.12	39,108
QRIP PACKAGE #3: Energy - Replace Lights	6.32	4.68	9,051
TOTAL			52,918

7.2 OMA-L Energy Projects

OMA-L projects have been programmed for implementation during Fiscal Year 1990. It is anticipated that construction could begin in April 1990, with completion by August 1990. These projects are identified as follows:

TABLE 11. OMA-L PROJECTS

PROJECT	S.I.R.	FY90 COST ($)
OMA-L PACKAGE #1: Replace Lights & Install Fans for Energy Conservation	3.75	76,363
OMA-L PACKAGE #2: Reclaim Heat for Energy Conservation	2.40	36,829
OMA-L PACKAGE #3: Provide EMCS System for Energy Conservation	1.59	28,889
OMA-L PACKAGE #4: Add Insulation for Energy Conservation	1.98	111,854
OMA-L PACKAGE #5: Provide Occupancy Sensors for Energy Conservation	1.70	18,940
OMA-L PACKAGE #6: Weatherstripping for Energy Conservation	6.19	6,713
TOTAL		279,588